

10 CSR 10-6.310 Restriction of Emissions from Municipal Solid Waste Landfills

(1) Applicability.

- (A) This rule applies to each municipal solid waste (MSW) landfill for which construction, reconstruction or modification was commenced before May 30, 1991, and has accepted waste at any time since November 8, 1987, or has additional design capacity available for future waste deposition. Landfills for which construction, reconstruction or modification was commenced on May 30, 1991 or after, are covered under the Environmental Protection Agency's New Source Performance Standard for Municipal Solid Waste Landfills.
- (B) Physical or operational changes made to an existing MSW landfill solely to comply with this rule are not considered construction, reconstruction, or modification for the purposes of this rule.
- (C) MSW landfills covered by 10 CSR 10-5.490 are exempt from this rule.
- (D) For purposes of obtaining an operating permit under Title V of the Clean Air Act, the owner or operator of an MSW landfill subject to this rule with a design capacity less than two and one-half (2.5) million megagrams or two and one-half (2.5) million cubic meters is not subject to the requirements to obtain an operating permit for the landfill under 40 Code of Federal Regulations (CFR) part 70 or 71, unless the landfill is otherwise subject to either 40 CFR part 70 or 71. For purposes of submitting a timely application for an operating permit under 40 CFR part 70 or 71, the owner or operator of an MSW landfill subject to the rule with a design capacity greater than or equal to two and one-half (2.5) million megagrams and two and one-half (2.5) million cubic meters on the effective date of EPA approval of the state's program under section 111(d) of the Clean Air Act (June 23, 1998), and not otherwise subject to either 40 CFR part 70 or 71, becomes subject to the requirements of section 70.5(a)(1)(i) or 71.5(a)(1)(i) of the Clean Air Act ninety (90) days after the effective date of such 111(d) program approval, even if the design capacity report is submitted earlier.
- (E) When an MSW landfill subject to this rule is closed, the owner or operator is no longer subject to the

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requirement to maintain an operating permit under 40 CFR part 70 or 71 for the landfill if the landfill is not otherwise subject to the requirements of either 40 CFR part 70 or 71 and if either of the following conditions is met:

1. The landfill was never subject to a requirement for a control system under section (3) of this rule; or
2. The owner or operator meets the conditions for control system removal specified in section 60.752(b)(2)(v) of subpart WWW.

(2) Definitions. Definitions of certain terms specified in this rule may be found in 10 CSR 10-6.020. Additional definitions are as follows:

- (A) Active collection system--A gas collection system that uses gas mover equipment;
- (B) Active landfill--A landfill in which solid waste is being placed or a landfill that is planned to accept waste in the future;
- (C) Closed landfill--A landfill in which solid waste is no longer being placed, and in which no additional solid wastes will be placed without first filing a notification of modification as prescribed under 40 Code of Federal Regulations (CFR) part 60.7(a)(4) (incorporated by reference). Once a notification of modification has been filed, and additional solid waste is placed in the landfill, the landfill is no longer closed.
- (D) Closure--That point in time when a landfill becomes a closed landfill;
- (E) Commercial solid waste--All types of solid waste generated by stores, offices, restaurants, warehouses, and other nonmanufacturing activities, excluding residential and industrial wastes;
- (F) Controlled landfill--Any landfill at which collection and control systems are required under this rule as a result of the nonmethane organic compounds emission rate. The landfill is considered controlled if a collection and control system design plan is submitted in compliance with subparagraph (3)(B)2.A. of this

rule;

- (G) Design capacity--The maximum amount of solid waste a landfill can accept, as indicated in terms of volume or mass in the most recent construction or operating permit issued by the state or local agency responsible for regulating the landfill, plus any in-place waste not accounted for in the most recent permit. If the owner or operator chooses to convert the design capacity from volume to mass or from mass to volume to demonstrate its design capacity is less than two and one-half (2.5) million megagrams or two and one-half (2.5) million cubic meters, the calculation must include a site-specific density, which must be recalculated annually;
- (H) Disposal facility--All contiguous land and structures, other appurtenances, and improvements on the land used for the disposal of solid waste;
- (I) Emission rate cutoff--The threshold annual emission rate to which a landfill compares its estimated emission rate to determine if control under the regulation is required;
- (J) Enclosed combustor--An enclosed firebox which maintains a relatively constant limited peak temperature generally using a limited supply of combustion air. An enclosed flare is considered an enclosed combustor;
- (K) Flare--An open combustor without enclosure or shroud;
- (L) Gas mover equipment--The equipment (that is, fan, blower, compressor) used to transport landfill gas through the header system;
- (M) Household waste--Any solid waste (including garbage, trash, and sanitary waste in septic tanks) derived from households (including, but not limited to, single and multiple residences, hotels and motels, bunkhouses, ranger stations, crew quarters, campgrounds, picnic grounds, and day-use recreation areas);
- (N) Industrial solid waste--Solid waste generated by manufacturing or industrial processes that is not a hazardous waste regulated under Subtitle C of the Resource Conservation and Recovery Act, 40 CFR parts 264 and 265 (incorporated by reference). Such waste may include, but is not limited to, waste resulting

from the following manufacturing processes: electric power generation; fertilizer/agricultural chemicals; food and related products/by-products; inorganic chemicals; iron and steel manufacturing; leather and leather products; nonferrous metals manufacturing/foundries; organic chemicals; plastics and resins manufacturing; pulp and paper industry; rubber and miscellaneous plastic products; stone, glass, clay, and concrete products; textile manufacturing; transportation equipment; and water treatment. This term does not include mining waste or oil and gas waste;

- (O) Interior well--Any well or similar collection component located inside the perimeter of the landfill waste. A perimeter well located outside the landfilled waste is not an interior well;
- (P) Landfill--An area of land or an excavation in which wastes are placed for permanent disposal, and that is not a land application unit, surface impoundment, injection well, or waste pile as those terms are defined under 40 CFR part 257.2 (incorporated by reference);
- (Q) Lateral expansion--A horizontal expansion of the waste boundaries of an existing MSW landfill. A lateral expansion is not a modification unless it results in an increase in the design capacity of the landfill;
- (R) Modification--An increase in the permitted volume design capacity of the landfill by either horizontal or vertical expansion based on its most recent permitted design capacity. Modification does not occur until the owner or operator commences construction on the horizontal or vertical expansion;
- (S) Municipal solid waste landfill or MSW landfill--An entire disposal facility in a contiguous geographical space where household waste is placed in or on land. An MSW landfill may also receive other types of Resource Conservation and Recovery Act (RCRA) Subtitle D wastes, 40 CFR part 257.2 (incorporated by reference) such as commercial solid waste, nonhazardous sludge, conditionally exempt small quantity generator waste, and industrial solid waste. Portions of an MSW landfill may be separated by access roads. An MSW landfill may be publicly or privately owned. An MSW landfill may be a new MSW landfill, an existing MSW landfill, or a lateral expansion;

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- (T) Municipal solid waste landfill emissions or MSW landfill emissions--Gas generated by the decomposition of organic waste deposited in an MSW landfill or derived from the evolution of organic compounds in the waste;
- (U) NMOC--Nonmethane organic compounds, as measured according to the provisions of section (5) of this rule;
- (V) Nondegradable waste--Any waste that does not decompose through chemical breakdown or microbiological activity. Examples are, but are not limited to, concrete, municipal waste combustor ash, and metals;
- (W) Passive collection system--A gas collection system that solely uses positive pressure within the landfill to move the gas rather than using gas mover equipment;
- (X) Sludge--Any solid, semisolid, or liquid waste generated from a municipal, commercial, or industrial wastewater treatment plant, water supply treatment plant, or air pollution control facility, exclusive of the treated effluent from a wastewater treatment plant;
- (Y) Solid waste--Any garbage, sludge from a wastewater treatment plant, water supply treatment plant, or air pollution control facility and other discarded material, including solid, liquid, semisolid, or contained gaseous material resulting from industrial, commercial, mining, and agricultural operations, and from community activities, but does not include solid or dissolved material in domestic sewage, or solid or dissolved materials in irrigation return flows or industrial discharges that are point sources subject to permits under 33 U.S.C. 1342 (incorporated by reference), or source, special nuclear, or by-product material as defined by the Atomic Energy Act of 1954, as amended (42 U.S.C. 2011 et seq., incorporated by reference);
- (Z) Sufficient density--Any number, spacing, and combination of collection system components, including vertical wells, horizontal collectors, and surface collectors, necessary to maintain emission and migration control as determined by measures of performance set forth in this rule; and
- (AA) Sufficient extraction rate--A rate sufficient to maintain a negative pressure at all wellheads in the collection system without causing air infiltration,

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including any wellheads connected to the system as a result of expansion or excess surface emissions, for the life of the blower.

(3) Standards for Air Emissions from Municipal Solid Waste Landfills.

(A) Each owner or operator of an MSW landfill having a design capacity less than two and one-half (2.5) million megagrams by mass or two and one-half (2.5) million cubic meters by volume shall submit an initial design capacity report to the director as provided in subsection (8)(A) of this rule. The landfill may calculate design capacity in either megagrams or cubic meters for comparison with the exemption values. Any density conversions shall be documented and submitted with the report. For purposes of part 70 permitting under 10 CSR 10-6.065, a landfill with a design capacity less than two and one-half (2.5) million megagrams or two and one-half (2.5) million cubic meters does not require an operating permit under 40 CFR part 70. Submittal of the initial design capacity report shall fulfill the requirements of this rule except as provided for in paragraphs (3)(A)1. and 2. of this rule.

1. The owner or operator shall submit to the director an amended design capacity report, as provided for in paragraph (8)(A)3. of this rule, when there is any increase in the design capacity of a landfill subject to the provisions of this rule, whether the increase results from an increase in the area or depth of the landfill, a change in the operating procedures of the landfill, or any other means.

2. If any increase in the maximum design capacity of a landfill exempted from the provisions of subsection (3)(B) through section (10) of this rule on the basis of the design capacity exemption in subsection (3)(A) of this rule, results in a revised maximum design capacity equal to or greater than two and one-half (2.5) million megagrams and two and one-half (2.5) million cubic meters, the owner or operator shall comply with the provisions of subsection (3)(B) of

this rule.

- (B) Each owner or operator of an MSW landfill having a design capacity equal to or greater than two and one-half (2.5) million megagrams and two and one-half (2.5) million cubic meters, shall either comply with paragraph (3)(B)2. of this rule or calculate an NMOC emission rate for the landfill using the procedures specified in section (5) of this rule. The NMOC emission rate shall be recalculated annually, except as provided in subparagraph (8)(B)1.B. of this rule. The owner or operator of an MSW landfill subject to this rule with a design capacity greater than or equal to two and one-half (2.5) million megagrams and two and one-half (2.5) million cubic meters is subject to part 70 permitting requirements. When a landfill is closed, and either never needed control or meets the conditions for control system removal specified in subparagraph (3)(B)2.E. of this rule, a part 70 operating permit is no longer required.

- 1. If the calculated NMOC emission rate is less than fifty (50) megagrams per year, the owner or operator shall-

- (A) Submit an annual emission report to the director, except as provided for in subparagraph (8)(B)1.B. of this rule; and

- (B) Recalculate the NMOC emission rate annually using the procedures specified in paragraph (5)(A)1. of this rule until such time as the calculated NMOC emission rate is equal to or greater than fifty (50) megagrams per year, or the landfill is closed.

- (I) If the NMOC emission rate, upon recalculation required in subparagraph (3)(B)1.B. of this rule is equal to or greater than fifty (50) megagrams per year, the owner or operator shall install a collection and control system in compliance with paragraph (3)(B)2. of this rule.

- (II) If the landfill is permanently closed, a closure notification shall be submitted to the director as provided for in subsection (8)(D) of this rule.

2. If the calculated NMOC emission rate is equal to or greater than fifty (50) megagrams per year, the owner or operator shall-
 - A. Submit a collection and control system design plan prepared by a professional engineer to the director within one (1) year. Permit modification approval from the Missouri Department of Natural Resources' Solid Waste Management Program shall be required prior to construction of any gas collection system.
 - (I) The collection and control system as described in the plan shall meet the design requirements of subparagraph (3)(B)2.B. of this rule.
 - (II) The collection and control system design plan shall include any alternatives to the operational standards, test methods, procedures, compliance measures, monitoring, record keeping or reporting provisions of sections (4) through (9) of this rule proposed by the owner or operator.
 - (III) The collection and control system design plan shall either conform with specifications for active collection systems in section (10) of this rule or include a demonstration to the director's satisfaction, such that human health and safety is protected, of the sufficiency of the alternative provisions to section (10) of this rule.
 - (IV) The director shall review the information submitted under parts (3)(B)2.A.(I), (II) and (III) of this rule and either approve it, disapprove it, or request that additional information be submitted. Because of the many site-specific factors involved with landfill gas system design, alternative systems may be necessary. A wide variety of system designs are possible, such as vertical wells, combination

horizontal and vertical collection systems, or horizontal trenches only, leachate collection components, and passive systems;

- B. Install a collection and control system that captures the gas generated within the landfill as required by part (3)(B)2.B.(I) or (II) and subparagraph (3)(B)2.C. of this rule within thirty (30) months after the first annual report in which the emission rate equals or exceeds fifty (50) megagrams per year, unless Tier 2 or Tier 3 sampling under section (5) of this rule demonstrates that the emission rate is less than fifty (50) megagrams per year, as specified in paragraph (8)(C)1. or 2. of this rule.

(I) An active collection system shall-

(a) Be designed to handle the maximum expected gas flow rate from the entire area of the landfill that warrants control over the intended use period of the gas control or treatment system equipment;

(b) Collect gas from each area, cell, or group of cells in the landfill in which the initial solid waste has been placed for a period of-

I. Five (5) years or more if active; or

II. Two (2) years or more if closed or at final grade;

(c) Collect gas at a sufficient extraction rate; and

(d) Be designed to minimize off-site migration of subsurface gas.

(II) A passive collection system shall-

(a) Comply with the provisions specified in subparts (3)(B)2.B.(I)(a), (b) and (d) of

this rule; and

- (b) Be installed with liners on the bottom and all sides in all areas in which gas is to be collected. The liners shall be installed as required under 40 CFR part 258.40 (incorporated by reference);
- C. Route all the collected gas to one or more of the following control systems:
 - (I) An open flare designed and operated in accordance with 40 CFR part 60.18 (incorporated by reference);
 - (II) A control system designed and operated to reduce NMOC by ninety-eight (98) weight-percent, or, when an enclosed combustion device is used for control, to either reduce NMOC by ninety-eight (98) weight-percent or reduce the outlet NMOC concentration to less than twenty parts per million by volume (20 ppmv), dry basis as hexane at three percent (3%) oxygen. The reduction efficiency or parts per million by volume shall be established by an initial performance test, to be completed no later than one hundred eighty (180) days after the initial startup of the approved control system using the test methods specified in subsection (5)(D) of this rule.
 - (a) If a boiler or process heater is used as the control device, the landfill gas stream shall be introduced into the flame zone.
 - (b) The control device shall be operated within the parameter ranges established during the initial or most recent performance test. The operating parameters to be monitored are specified in section (7) of this rule; or
 - (III) A system that routes the collected gas to a treatment system that processes the collected gas for subsequent sale or use. All

emissions from any atmospheric vent from the gas treatment system shall be subject to the requirements of part (3)(B)2.C.(I) or (II) of this rule;

D. Operate the collection and control device installed to comply with this rule in accordance with the provisions of sections (4), (6) and (7) of this rule;

E. The collection and control system may be capped or removed provided that all the conditions of parts (3)(B)2.E.(I), (II) and (III) of this rule are met-

(I) The landfill shall be no longer accepting solid waste and be permanently closed under the requirements of 40 CFR part 258.60 (incorporated by reference). A closure report shall be submitted to the director as provided in subsection (8)(D) of this rule;

(II) The collection and control system shall have been in operation a minimum of fifteen (15) years; and

(III) Following the procedures specified in subsection (5)(B) of this rule, the calculated NMOC gas produced by the landfill shall be less than fifty (50) megagrams per year on three (3) successive test dates. The test dates shall be no less than ninety (90) days apart, and no more than one hundred eighty (180) days apart; and

F. The planning, awarding of contracts, and installation of MSW landfill air emission collection and control equipment capable of meeting the emission standards in subsection (3)(B) of this rule shall be accomplished within thirty (30) months after the date the initial NMOC emission rate report shows NMOC emissions equal or exceed fifty (50) megagrams per year.

(4) Operational Standards for Collection and Control Systems. Each owner or operator of an MSW landfill gas collection and control system used to comply with the provisions of subparagraph (3)(B)2.B. of this rule shall-

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- (A) Operate the collection system such that gas is collected from each area, cell, or group of cells in the MSW landfill in which solid waste has been in place for—
 - 1. Five (5) years or more if active; or
 - 2. Two (2) years or more if closed or at final grade;
- (B) Operate the collection system with negative pressure at each well head except under the following conditions:
 - 1. A fire or increased well temperature. The owner or operator shall record instances when positive pressure occurs in efforts to avoid a fire. These records shall be submitted with the annual reports as provided in paragraph (8)(F)1. of this rule;
 - 2. Use of a geomembrane or synthetic cover. The owner or operator shall develop acceptable pressure limits in the design plan; and
 - 3. A decommissioned well. A well may experience a static positive pressure after shut down to accommodate for declining flows. All design changes shall be approved by the director;
- (C) Operate each interior wellhead in the collection system with a landfill gas temperature less than fifty-five degrees Celsius (55°C) and with either a nitrogen level less than twenty percent (20%) or an oxygen level less than five percent (5%). The owner or operator may establish a higher operating temperature, nitrogen, or oxygen value at a particular well. A higher operating value demonstration shall show supporting data that the elevated parameter does not cause fires or significantly inhibit anaerobic decomposition by killing methanogens.
 - 1. The nitrogen level shall be determined using Method 3C of Appendix A, 40 CFR part 60 (incorporated by reference), unless an alternative test method is established as allowed by subparagraph (3)(B)2.A. of this rule.
 - 2. Unless an alternative test method is established as allowed by subparagraph (3)(B)2.A. of this rule, the oxygen shall be determined by an oxygen meter using Method 3A of Appendix A, 40 CFR Part 60 (incorporated by reference), except that—

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- A. The span shall be set so that the regulatory limit is between twenty and fifty percent (20%-50%) of the span;
 - B. A data recorder is not required;
 - C. Only two (2) calibration gases are required, a zero and span, and ambient air may be used as the span;
 - D. A calibration error check is not required; and
 - E. The allowable sample bias, zero drift, and calibration drift are plus or minus ten percent ("10%);
- (D) Operate the collection system so that the methane concentration is less than five hundred (500) parts per million above background at the surface of the landfill. To determine if this level is exceeded, the owner or operator shall conduct surface testing around the perimeter of the collection area along a pattern that traverses the landfill at thirty (30)-meter intervals and where visual observations indicate elevated concentrations of landfill gas, such as distressed vegetation and cracks or seeps in the cover. The owner or operator may establish an alternative traversing pattern that ensures equivalent coverage. A surface monitoring design plan shall be developed that includes a topographical map with the monitoring route and the rationale for any site-specific deviations from the thirty (30)-meter intervals. Areas with steep slopes or other dangerous areas may be excluded from the surface testing;
- (E) Operate the system such that all collected gases are vented to a control system designed and operated in compliance with subparagraph (3)(B)2.C. of this rule. In the event the collection or control system is inoperable, the gas mover system shall be shut down and all valves in the collection and control system contributing to venting of the gas to the atmosphere shall be closed within one (1) hour;
- (F) Operate the control or treatment system at all times when the collected gas is routed to the system; and
- (G) If monitoring demonstrates that the operational requirements in subsection (4)(B), (C), or (D) of this rule are not met, corrective action shall be taken as specified in paragraph (3)(A)3. through 5. or

subsection (6)(C) of this rule. If corrective actions are taken as specified in section (6) of this rule, the monitored exceedance is not a violation of the operational requirements in this section.

(5) Test Methods and Procedures.

(A) NMOC Emission Rate Calculation.

1. The landfill owner or operator shall calculate the NMOC emission rate using either the equation provided in subparagraph (5)(A)1.A. of this rule or the equation provided in subparagraph (5)(A)1.B. of this rule. Both equations may be used if the actual year-to-year solid waste acceptance rate is known. The values to be used in both equations are 0.05 per year for k , one hundred seventy (170) cubic meters per megagram for L_o , and four thousand (4,000) parts per million by volume as hexane for the CNMOC. For landfills located in geographical areas with a thirty (30)-year annual average precipitation of less than twenty-five inches (25"), as measured at the nearest representative official meteorologic site, the k value to be used is 0.02 per year.
- A. The following equation shall be used if the actual year-to-year solid waste acceptance rate is known. The mass of nondegradable solid waste may be subtracted from the total mass of solid waste in a particular section of the landfill when calculating the value for M_i if the documentation of the nature and amount of such wastes is maintained.

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$$M_{NMOC} = \sum_{i=1}^n 2 k L_o M_i (e^{-kt_i}) (C_{NMOC}) (3.6 \times 10^{-9})$$

where,

M_{NMOC} = Total NMOC emission rate from the landfill, megagrams per year

k = methane generation rate constant, year⁻¹

L_o = methane generation potential, cubic meters per megagram solid waste

M_i = mass of solid waste in the i^{th} section, megagrams

t_i = age of the i^{th} section, years

C_{NMOC} = concentration of NMOC, parts per million by volume as hexane

3.6×10^{-9} = conversion factor

- B. The following equation shall be used if the

actual year-to-year solid waste acceptance rate is unknown. The mass of nondegradable solid waste may be subtracted from the average annual acceptance rate when calculating a value for R, if the documentation provisions of paragraph (9)(D)2. of this rule are followed.

$$M_{\text{NMOC}} = 2 L_o R (e^{-kc} - e^{-kt}) (C_{\text{NMOC}})(3.6 \times 10^{-9})$$

where,

$$\begin{aligned} M_{\text{NMOC}} &= \text{mass emission rate of NMOC, megagrams per year} \\ L_o &= \text{methane generation potential, cubic meters per megagram solid waste} \\ R &= \text{average annual acceptance rate, megagrams per year} \\ k &= \text{methane generation rate constant, year}^{-1} \\ t &= \text{age of landfill, years} \\ C_{\text{NMOC}} &= \text{concentration of NMOC, parts per million by volume as hexane} \\ c &= \text{time since closure, years. For active landfill } c = 0 \text{ and } e^{-kc} = 1 \end{aligned}$$

$$3.6 \times 10^{-9} = \text{conversion factor}$$

2. Tier 1. The owner or operator shall compare the calculated NMOC mass emission rate to the standard of fifty (50) megagrams per year.
 - A. If the NMOC emission rate calculated in paragraph (5)(A)1. of this rule is less than fifty (50) megagrams per year, then the landfill owner shall submit an emission rate report as provided in paragraph (8)(B)1. of this rule, and shall recalculate the NMOC mass emission rate annually as required under paragraph (3)(B)1. of this rule.
 - B. If the calculated NMOC emission rate is equal to or greater than fifty (50) megagrams per year, then the landfill owner shall either comply with paragraph (3)(B)2. of this rule, or determine a site-specific NMOC concentration and recalculate the NMOC emission rate using the procedures provided in paragraph (5)(A)3. of this rule.

3. Tier 2. The landfill owner or operator shall

determine the NMOC concentration using the following sampling procedure. The landfill owner or operator shall install at least two (2) sample probes per hectare of landfill surface that has retained waste for at least two (2) years. If the landfill is larger than twenty-five (25) hectares in area, only fifty (50) samples are required. The sample probes should be located to avoid known areas of nondegradable solid waste. The owner or operator shall collect and analyze one (1) sample of landfill gas from each probe to determine the NMOC concentration using Method 25C or Method 18 of Appendix A, 40 CFR part 60 (incorporated by reference). If using Method 18, the minimum list of compounds to be tested shall be those published in the most recent Compilation of Air Pollutant Emission Factors, Volume I: Stationary Point and Area Sources (AP-42), available from the Government Printing Office. If composite sampling is used, equal volumes shall be taken from each sample probe. If more than the required number of samples are taken, all samples shall be used in the analysis. The landfill owner or operator shall divide the NMOC concentration from Method 25C by six (6) to convert from C_{NMOC} as carbon to C_{NMOC} as hexane.

- A. The landfill owner or operator shall recalculate the NMOC mass emission rate using the equations provided in subparagraph (5)(A)1.A. or B. of this rule and using the average NMOC concentration from the collected samples instead of the default value in the equation provided in paragraph (5)(A)1. of this rule.
- B. If the resulting mass emission rate calculated using the site-specific NMOC concentration is equal to or greater than fifty (50) megagrams per year, then the landfill owner or operator shall either comply with paragraph (3)(B)2. of this rule, or determine the site-specific methane generation rate constant and recalculate the NMOC emission rate using the site-specific methane generation rate using the procedure specified in paragraph (5)(A)4. of this rule.
- C. If the resulting NMOC mass emission rate is less than fifty (50) megagrams per year, the owner or operator shall submit a periodic estimate of the emission rate report as provided in paragraph (8)(B)1. of this rule and retest the site-specific NMOC concentration every five (5) years using the

methods specified in this section.

4. Tier 3. The site-specific methane generation rate constant shall be determined using the procedures provided in Method 2E of Appendix A, 40 CFR part 60 (incorporated by reference). The landfill owner or operator shall estimate the NMOC mass emission rate using equations in subparagraph (5)(A)1.A. or B. of this rule and using a site-specific methane generation rate constant k , and the site-specific NMOC concentration as determined in paragraph (5)(A)3. of this rule instead of the default values provided in paragraph (5)(A)1. of this rule. The landfill owner or operator shall compare the resulting NMOC mass emission rate to the standard of fifty (50) megagrams per year.
 - A. If the NMOC mass emission rate as calculated using the site-specific methane generation rate and concentration of NMOC is equal to or greater than fifty (50) megagrams per year, the owner or operator shall comply with paragraph (3)(B)2. of this rule.
 - B. If the NMOC mass emission rate is less than fifty (50) megagrams per year, then the owner or operator shall submit a periodic emission rate report as provided in paragraph (8)(B)1. of this rule and shall recalculate the NMOC mass emission rate annually, as provided in paragraph (8)(B)1. of this rule using the equations in paragraph (5)(A)1. of this rule and using the site-specific methane generation rate constant and NMOC concentration obtained in paragraph (5)(A)3. of this rule. The calculation of the methane generation rate constant is performed only once, and the value obtained from this test shall be used in all subsequent annual NMOC emission rate calculations.
5. The owner or operator may use other methods to determine the NMOC concentration or a site-specific k as an alternative to the methods required in paragraphs (5)(A)3. and 4. of this rule if the method has been approved by the director.
6. The owner or operator may recalculate the NMOC mass emission rate using AP-42 values instead of the default values provided in paragraph (5)(A)1. of this rule as an alternative to the methods required in paragraph (5)(A)3. or 4. of this rule.

- (B) After the installation of a collection and control system in compliance with section (6) of this rule, the owner or operator shall calculate the NMOC emission rate for purposes of determining when the system can be removed as provided in subparagraph (3)(B)2.E. of this rule, using the following equation:

$$M_{\text{NMOC}} = 1.89 \times 10^{-3} Q_{\text{LFG}} C_{\text{NMOC}}$$

where,

$$M_{\text{NMOC}} = \text{mass emission rate of NMOC, megagrams per year}$$

$$Q_{\text{LFG}} = \text{flow rate of landfill gas, cubic meters per minute}$$

$$C_{\text{NMOC}} = \text{NMOC concentration, parts per million by volume as hexane}$$

1. The flow rate of landfill gas, Q_{LFG} , shall be determined by measuring the total landfill gas flow rate at the common header pipe that leads to the control device using a gas flow measuring device calibrated according to the provisions of section 4 of Method 2E.
 2. The average NMOC concentration, C_{NMOC} , shall be determined by collecting and analyzing landfill gas sampled from the common header pipe before the gas moving or condensate removal equipment using the procedures in Method 25C or Method 18. If using Method 18, the minimum list of compounds to be tested shall be those published in the most recent Compilation of Air Pollutant Emission Factors (AP-42). The sample location on the common header pipe shall be before any condensate removal or other gas refining units. The landfill owner or operator shall divide the NMOC concentration from Method 25C by six (6) to convert from C_{NMOC} as carbon to C_{NMOC} as hexane.
 3. The owner or operator may use another method to determine landfill gas flow rate and NMOC concentration if the method has been approved by the director as provided in part (3)(B)2.A.(II) of this rule.
- (C) The owner or operator of each MSW landfill subject to the provisions of this rule shall estimate the NMOC emission rate for comparison to the prevention of significant deterioration (PSD) major source and significance levels in 40 CFR part 51.166 or 52.21 (incorporated by reference) using AP-42 or other approved measurement procedures. If a collection system, which complies with the provisions in paragraph (3)(B)2. of this rule is already installed, the owner or operator shall estimate the NMOC emission rate using

the procedures provided in subsection (5)(B).

- (D) For the performance test required in part (3)(B)2.C.(II) of this rule, Method 25C or Method 18 shall be used to determine compliance with ninety-eight (98) weight-percent efficiency or the twenty (20) ppmv outlet concentration level, unless another method to demonstrate compliance has been approved by the director as provided by part (3)(B)2.A.(II) of this rule. If using Method 18, the minimum list of compounds to be tested shall be those published in the most recent Compilation of Air Pollutant Emission Factors (AP-42). The following equation shall be used to calculate efficiency:

Control Efficiency = $(\text{NMOC}_{\text{in}} - \text{NMOC}_{\text{out}}) / (\text{NMOC}_{\text{in}})$
 where,

NMOC_{in} = mass of NMOC entering control device

NMOC_{out} = mass of NMOC exiting control device

(6) Compliance Provisions.

- (A) Except as provided in part (3)(B)2.A.(II) of this rule, the specified methods in paragraphs (6)(A)1. through (6)(A)6. of this rule shall be used to determine whether the gas collection system is in compliance with subparagraph (3)(B)2.B. of this rule.

1. For the purposes of calculating the maximum expected gas generation flow rate from the landfill to determine compliance with subpart (3)(B)2.B.(I)(a) of this rule, one (1) of the following equations shall be used. The k and Lo kinetic factors should be those published in the most recent Compilation of Air Pollutant Emission Factors (AP-42) or other site specific values demonstrated to be appropriate and approved by the director. If k has been determined as specified in paragraph (5)(A)4. of this rule, the value of k determined from the test shall be used. A value of no more than fifteen (15) years shall be used for the intended use period of the gas mover equipment. The active life of the landfill is the age of the landfill plus the estimated number of years until closure.

- A. For sites with unknown year-to-year solid waste

acceptance rate—

$$Q_m = 2L_o R (e^{-kc} - e^{-kt})$$

where,

$$Q_m = \text{maximum expected gas generation flow rate, cubic meters per year}$$

$$L_o = \text{methane generation potential, cubic meters per megagram solid waste}$$

$$R = \text{average annual acceptance rate, megagrams per year}$$

$$k = \text{methane generation rate constant, year}^{-1}$$

$$t = \text{age of the landfill at equipment installation plus the time the owner or operator intends to use the gas mover equipment or active life of the landfill, whichever is less. If the equipment is installed after closure, } t \text{ is the age of the land-fill at installation, years}$$

$$c = \text{time since closure, years (for an active landfill } c = 0 \text{ and } e^{-kc} = 1)$$

B. For sites with known year-to-year solid waste acceptance rate—

$$Q_M = \sum_{i=1}^n 2 k L_o M_i (e^{-kt_i})$$

where,

$$Q_M = \text{maximum expected gas generation flow rate, cubic meters per year}$$

$$k = \text{methane generation rate constant, year}^{-1}$$

$$L_o = \text{methane generation potential, cubic meters per mega gram solid waste}$$

$$M_i = \text{mass of solid waste in the } i^{\text{th}} \text{ section, megagrams}$$

$$t_i = \text{age of the } i^{\text{th}} \text{ section, years}$$

C. If a collection and control system has been installed, actual flow data may be used to project the maximum expected gas generation flow rate instead of, or in conjunction with, the equations in subparagraphs (6)(A)1.A. and B. of this rule. If the landfill is still accepting waste, the actual measured flow data will not equal the maximum expected gas generation rate, so calculations using the equations in subparagraphs (6)(A)1.A. or B. of this rule or other methods shall be used to predict the maximum expected gas generation rate over the intended period of use of the gas control system equipment.

2. For the purposes of determining sufficient

density of gas collectors for compliance with subpart (3)(B)2.B.(I)(b) of this rule, the owner or operator shall design a system of vertical wells, horizontal collectors, or other collection devices, satisfactory to the director, capable of controlling and extracting gas from all portions of the landfill sufficient to meet all operational and performance standards.

3. For the purpose of demonstrating whether the gas collection system flow rate is sufficient to determine compliance with subpart (3)(B)2.B.(I)(c) of this rule, the owner or operator shall measure gauge pressure in the gas collection header at each individual well, monthly. If a positive pressure exists, action shall be initiated to correct the exceedance within five (5) calendar days, except for the three (3) conditions allowed under subsection (4)(B) of this rule. If negative pressure cannot be achieved without excess air infiltration within fifteen (15) calendar days of the first measurement, the gas collection system shall be expanded to correct the exceedance within one hundred twenty (120) days of the initial measurement of positive pressure. Any attempted corrective measure shall not cause exceedances of other operational or performance standards. An alternative timeline for correcting the exceedance may be submitted to the director for approval.
4. Owners or operators are not required to expand the system as required in paragraphs (6)(A)3. of this rule during the first one hundred eighty (180) days after gas collection system start-up.
5. For the purpose of identifying whether excess air infiltration into the landfill is occurring, the owner or operator shall monitor each well monthly for temperature and nitrogen or oxygen as provided in subsection (4)(C) of this rule. If a well exceeds one (1) of these operating parameters, action shall be initiated to correct the exceedance within five (5) calendar days. If correction of the exceedance cannot be achieved within fifteen (15) calendar days of the first measurement, the gas collection system shall be expanded to correct the exceedance within one hundred twenty (120) days of the initial exceedance. Any attempted corrective measure

shall not cause exceedances of other operational or performance standards. An alternative timeline for correcting the exceedance may be submitted to the director for approval.

6. An owner or operator seeking to demonstrate compliance with subpart (3)(B)2.B.(I)(d) of this rule through the use of a collection system not conforming to the specifications provided in section (10) of this rule shall provide information satisfactory to the director as specified in part (3)(B)2.A.(III) of this rule demonstrating that off-site migration is being controlled.
- (B) For purposes of compliance with subsection (4)(A) of this rule, each owner or operator of a controlled landfill shall place each well or design component as specified in the approved design plan as provided in subparagraph (3)(B)2.A. of this rule. Each well shall be installed no later than sixty (60) days of the date in which the initial solid waste has been in place for a period of-
1. Five (5) years or more if active; or
 2. Two (2) years or more if closed or at final grade.
- (C) The following procedures shall be used for compliance with the surface methane operational standard as provided in subsection (4)(D) of this rule:
1. After installation of the collection system, the owner or operator shall monitor surface concentrations of methane along the entire perimeter of the collection area and along a pattern that traverses the landfill at thirty (30)-meter intervals (or a site-specific established spacing) for each collection area on a quarterly basis using an organic vapor analyzer, flame ionization detector, or other portable monitor meeting the specifications provided in subsection (6)(D) of this rule;
 2. The background concentration shall be determined by moving the probe inlet upwind and downwind outside the boundary of the landfill at a distance of at least thirty (30) meters from the perimeter wells;
 3. Surface emission monitoring shall be

performed in accordance with section 4.3.1 of Method 21 of Appendix A, 40 CFR part 60 (incorporated by reference), except that the probe inlet shall be placed within five to ten centimeters (5-10 cm) of the ground. Monitoring shall be performed during typical meteorological conditions;

4. Any reading of five hundred (500) parts per million (ppm) or more above background at any location shall be recorded as a monitored exceedance and the actions specified in subparagraphs (6)(C)4.A. through E. of this rule shall be taken. As long as the specified actions are taken, the exceedance is not a violation of the operational requirements of subsection (4)(D) of this rule.
 - A. The location of each monitored exceedance shall be marked and the location recorded.
 - B. Cover maintenance or adjustments to the vacuum of the adjacent wells to increase the gas collection in the vicinity of each exceedance shall be made and the location shall be remonitored within ten (10) calendar days of detecting the exceedance.
 - C. If the remonitoring of the location shows a second exceedance, additional corrective action shall be taken and the location shall be monitored again within ten (10) days of the second exceedance. If the remonitoring shows a third exceedance for the same location, the action specified in subparagraph (6)(C)4.E. of this rule shall be taken, and no further monitoring of that location is required until the action specified in subparagraph (6)(C)4.E. of this rule has been taken.
 - D. Any location that initially showed an exceedance but has a methane concentration less than five hundred (500) ppm methane above background at the ten (10)-day remonitoring specified in subparagraph (6)(C)4.B. or C. of this rule shall be remonitored one (1) month from the initial exceedance. If the one (1)-month remonitoring shows a

concentration less than five hundred (500) ppm above background, no further monitoring of that location is required until the next quarterly monitoring period. If the one (1)-month remonitoring shows an exceedance, the actions specified in subparagraph (6)(C)4.C. or E. of this rule shall be taken.

E. For any location where monitored methane concentration equals or exceeds five hundred (500) ppm above background three (3) times within a quarterly period, a new well or other collection device shall be installed within one hundred twenty (120) calendar days of the initial exceedance. An alternative remedy to the exceedance, such as upgrading the blower, header pipes or control device, and a corresponding timeline for installation may be submitted to the director for approval; and

5. The owner or operator shall implement a program to monitor for cover integrity and implement cover repairs as necessary on a monthly basis.

(D) Each owner or operator seeking to comply with the provisions in subsection (6)(C) of this rule shall comply with the following instrumentation specifications and procedures for surface emission monitoring devices:

1. The portable analyzer shall meet the instrument specifications provided in section 3 of Method 21, except that "methane" shall replace all references to VOC;
2. The calibration gas shall be methane, diluted to a nominal concentration of five hundred (500) ppm in air;
3. To meet the performance evaluation requirements in section 3.1.3 of Method 21, the instrument evaluation procedures of section 4.4 of Method 21 shall be used; and
4. The calibration procedures provided in section 4.2 of Method 21 shall be followed immediately before commencing a surface monitoring survey

- (E) The provisions of this rule apply at all times, except during periods of start-up, shutdown, or malfunction, provided that the duration of start-up, shutdown, or malfunction shall not exceed five (5) days for collection systems and shall not exceed one (1) hour for treatment or control devices.
- (7) Monitoring of Operations. Except as provided in part (3)(B)2.A.(II) of this rule-
- (A) Each owner or operator seeking to comply with part (3)(B)2.B.(I) of this rule for an active gas collection system shall install a sampling port and a thermometer or other temperature measuring device, or an access port for temperature measurements at each wellhead and-
 - 1. Measure the gauge pressure in the gas collection header on a monthly basis as provided in paragraph (6)(A)3. of this rule; and
 - 2. Monitor nitrogen or oxygen concentration in the landfill gas on a monthly basis as provided in paragraph (6)(A)5. of this rule; and
 - 3. Monitor temperature of the landfill gas on a monthly basis as provided in paragraph (6)(A)5. of this rule;
 - (B) Each owner or operator seeking to comply with subparagraph (3)(B)2.C. of this rule using an enclosed combustor shall calibrate, maintain, and operate according to the manufacturer's specifications, the following equipment:
 - 1. A temperature monitoring device equipped with a continuous recorder and having a minimum accuracy of plus or minus one percent ($\pm 1\%$) of the temperature being measured expressed in degrees Celsius or plus or minus one-half degree Celsius ($\pm 0.5^\circ\text{C}$), whichever is greater. A temperature monitoring device is not required for boilers or process heaters with design heat input capacity greater than forty-four (44) megawatts; and
 - 2. A device that records flow to or bypass of the control device. The owner or operator shall either-
 - A. Install, calibrate, and maintain a gas flow rate measuring device that shall record the flow to the control device at least every fifteen (15) minutes; or
 - B. Secure the bypass line valve in the closed

position with a car-seal or a lock-and-key type configuration. A visual inspection of the seal or closure mechanism shall be performed at least once every month to ensure that the valve is maintained in the closed position and that the gas flow is not diverted through the bypass line;

- (C) Each owner or operator seeking to comply with subparagraph (3)(B)2.C. of this rule using an open flare shall install, calibrate, maintain, and operate according to the manufacturer's specifications the following equipment:
 - 1. A heat sensing device, such as an ultraviolet beam sensor or thermocouple, at the pilot light or the flame itself to indicate the continuous presence of a flame; and
 - 2. A device that records flow to or bypass of the flare. The owner or operator shall either-
 - A. Install, calibrate, and maintain a gas flow rate measuring device that shall record the flow to the control device at least every fifteen (15) minutes; or
 - B. Secure the bypass line valve in the closed position with a car-seal or a lock-and-key type configuration. A visual inspection of the seal or closure mechanism shall be performed at least once every month to ensure that the valve is maintained in the closed position and that the gas flow is not diverted through the bypass line;
- (D) Each owner or operator seeking to demonstrate compliance with subparagraph (3)(B)2.C. of this rule using a device other than an open flare or an enclosed combustor shall provide information satisfactory to the director as provided in part (3)(B)2.A.(II) of this rule describing the operation of the control device, the operating parameters that would indicate proper performance, and appropriate monitoring procedures. The director shall review the information and either approve it, or request that additional information be submitted. The director may specify additional appropriate monitoring procedures to insure that human health and safety is protected;
- (E) Each owner or operator seeking to install a collection system that does not meet the specifications in section (10) of this rule or seeking to monitor alternative parameters to those required by sections (4) through (7) of this rule shall provide information

satisfactory to the director as provided in parts (3)(B)2.A.(II) and (III) of this rule describing the design and operation of the collection system, the operating parameters that would indicate proper performance, and appropriate monitoring procedures. The director may specify additional appropriate monitoring procedures to insure that human health and safety is protected; or

- (F) Each owner or operator seeking to demonstrate compliance with subsection (6)(C) of this rule, shall monitor surface concentrations of methane according to the instrument specifications and procedures provided in subsection (6)(D) of this rule. Any closed landfill that has no monitored exceedances of the operational standard in three (3) consecutive quarterly monitoring periods may skip to annual monitoring. Any methane reading of five hundred (500) ppm or more above background detected during the annual monitoring returns the frequency for that landfill to quarterly monitoring.

(8) Reporting Requirements. Except as provided in part (3)(B)2.A.(II) of this rule-

- (A) Each owner or operator subject to the requirements of this rule shall submit an initial design capacity report to the director.

- 1. The initial design capacity report shall be submitted within ninety (90) days of the rule effective date.

- 2. The initial design capacity report shall contain the following information:

- A. A map or plot of the landfill, providing the size and location of the landfill, and identifying all areas where solid waste may be landfilled according to the provisions of the state or local construction or operating permit; and

- B. The maximum design capacity of the landfill. Where the maximum design capacity is specified in the state or local construction permit, a copy of the permit specifying the maximum design capacity may be submitted as part of the report. If the maximum design capacity of the landfill is not specified in the permit, the maximum design capacity shall be calculated using good engineering practices. The calculations shall be provided, along with such parameters as depth of solid waste, solid waste acceptance rate,

and compaction practices as part of the report. The state, local agency, or director may request other reasonable information as may be necessary to verify the maximum design capacity of the landfill.

3. An amended design capacity report shall be submitted to the director providing notification of any increase in the design capacity of the landfill, whether the increase results from an increase in the permitted area or depth of the landfill, a change in the operating procedures, or any other means which results in an increase in the maximum design capacity of the landfill above two and one-half (2.5) million megagrams and two and one-half (2.5) million cubic meters. The amended design capacity report shall be submitted within ninety (90) days of the issuance of an amended construction or operating permit, or the placement of waste in additional land, or the change in operating procedures which will result in an increase in maximum design capacity, whichever occurs first;
- (B) Each owner or operator subject to the requirements of this rule shall submit an NMOC emission rate report to the director initially and annually thereafter, except as provided for in subparagraph (8)(B)3. of this rule. The director may request such additional information as may be necessary to verify the reported NMOC emission rate.
1. The NMOC emission rate report shall contain an annual or five (5)-year estimate of the NMOC emission rate calculated using the formula and procedures provided in subsection (5)(A) or (B) of this rule, as applicable.
 - A. The initial NMOC emission rate report shall be submitted within ninety (90) days of the rule reflective date and may be combined with the initial design capacity report required in subsection (8)(A) of this rule. Subsequent NMOC emission rate reports shall be submitted annually thereafter, except as provided for in subparagraph (8)(B)1.B. and paragraph (8)(B)3. of this rule.
 - B. If the estimated NMOC emission rate as reported in the annual report to the director is less than fifty (50) megagrams per year in each of the next five (5) consecutive years, the owner or operator may elect to submit an estimate of the NMOC emission rate for the next five (5)-year period in lieu of the

annual report. This estimate shall include the current amount of solid waste-in-place and the estimated waste acceptance rate for each year of the five (5) years for which an NMOC emission rate is estimated. All data and calculations upon which this estimate is based shall be provided to the director. This estimate shall be revised at least once every five (5) years. If the actual waste acceptance rate exceeds the estimated waste acceptance rate in any year reported in the five (5)-year estimate, a revised five (5)-year estimate shall be submitted to the director. The revised estimate shall cover the five (5)-year period beginning with the year in which the actual waste acceptance rate exceeded the estimated waste acceptance rate.

2. The NMOC emission rate report shall include all the data, calculations, sample reports and measurements used to estimate the annual or five (5)-year emissions.
 3. Each owner or operator subject to the requirements of this rule is exempted from the requirements of paragraphs (8)(B)1. and 2. of this rule after the installation of a collection and control system in compliance with paragraph (3)(B)2. of this rule, during such time as the collection and control system is in operation and in compliance with sections (4) and (6) of this rule;
- (C) Each owner or operator subject to the provisions of subparagraph (3)(B)2.A. of this rule shall submit a collection and control system design plan to the director within one (1) year of the first report, required under subsection (8)(B) of this rule, in which the emission rate exceeds fifty (50) megagrams per year, except as follows:
1. If the owner or operator elects to recalculate the NMOC emission rate after Tier 2 NMOC sampling and analysis as provided in paragraph (5)(A)3. of this rule and the resulting rate is less than fifty (50) megagrams per year, annual periodic reporting shall be resumed, using the Tier 2 determined site-specific NMOC concentration, until the calculated emission rate is equal to or greater than fifty (50) megagrams per year or the landfill is closed. The revised NMOC emission rate report, with the recalculated emission rate based on NMOC sampling and analysis, shall be submitted within one hundred eighty (180) days of the first calculated exceedance of fifty (50) megagrams per

year; and

2. If the owner or operator elects to recalculate the NMOC emission rate after determining a site-specific methane generation rate constant (k), as provided in Tier 3 in paragraph (5)(A)4. of this rule, and the resulting NMOC emission rate is less than fifty (50) Mg/yr, annual periodic reporting shall be resumed. The resulting site-specific methane generation rate constant (k) shall be used in the emission rate calculation until such time as the emissions rate calculation results in an exceedance. The revised NMOC emission rate report based on the provisions of paragraph (5)(A)4. of this rule and the resulting site-specific methane generation rate constant (k) shall be submitted to the director within one (1) year of the first calculated emission rate exceeding fifty (50) megagrams per year;
- (D) Each owner or operator of a controlled landfill shall submit a closure report to the director within thirty (30) days of waste acceptance cessation. The director may request additional information as may be necessary to verify that permanent closure has taken place in accordance with the requirements of 40 CFR part 258.60 (incorporated by reference). If a closure report has been submitted to the director, no additional wastes may be placed into the landfill without filing a notification of modification as described under 40 CFR part 60.7(a)(4) (incorporated by reference);
- (E) Each owner or operator of a controlled landfill shall submit an equipment removal report to the director thirty (30) days prior to removal or cessation of operation of the control equipment.
1. The equipment removal report shall contain all of the following items:
 - A. A copy of the closure report submitted in accordance with subsection (8)(D) of this rule;
 - B. A copy of the initial performance test report demonstrating that the fifteen (15)-year minimum control period has expired; and
 - C. Dated copies of three (3) successive NMOC emission rate reports demonstrating that the landfill is no longer producing fifty (50) megagrams or greater of NMOC per year.
 2. The director may request such additional information as may be necessary to verify that all

of the conditions for removal in subparagraph (3)(B)2.E. of this rule have been met;

- (F) Each owner or operator of a landfill seeking to comply with paragraph (3)(B)2. of this rule using an active collection system designed in accordance with subparagraph (3)(B)2.B. of this rule shall submit to the director annual reports of the recorded information in paragraphs (8)(F)1. through 6. of this rule. The initial annual report shall be submitted within one hundred eighty (180) days of installation and start-up of the collection and control system, and shall include the initial performance test report required under 40 CFR part 60.8 (incorporated by reference). For enclosed combustion devices and flares, reportable exceedances are defined under subsection (9)(C) of this rule.
 - 1. Value and length of time for exceedance of applicable parameters monitored under subsections (7)(A), (B), (C), and (D) of this rule.
 - 2. Description and duration of all periods when the gas stream is diverted from the control device through a bypass line or the indication of bypass flow as specified under section (7) of this rule.
 - 3. Description and duration of all periods when the control device was not operating for a period exceeding one (1) hour and length of time the control device was not operating.
 - 4. All periods when the collection system was not operating in excess of five (5) days.
 - 5. The location of each exceedance of the five hundred (500) ppm methane concentration as provided in subsection (4)(D) of this rule and the concentration recorded at each location for which an exceedance was recorded in the previous month.
 - 6. The date of installation and the location of each well or collection system expansion added pursuant to paragraph (6)(A)3., subsection (6)(B), and paragraph (6)(C)4. of this rule; and
- (G) Each owner or operator seeking to comply with subparagraph (3)(B)2.A. of this rule shall include the following information with the initial performance test report required under 40 CFR part 60.8 (incorporated by reference):
 - 1. A diagram of the collection system showing collection system positioning including all wells, horizontal collectors, surface collectors, or

other gas extraction devices, including the locations of any areas excluded from collection and the proposed sites for the future collection system expansion;

2. The data upon which the sufficient density of wells, horizontal collectors, surface collectors, or other gas extraction devices and the gas mover equipment sizing are based;
3. The documentation of the presence of asbestos or nondegradable material for each area from which collection wells have been excluded based on the presence of asbestos or nondegradable material;
4. The sum of the gas generation flow rates for all areas from which collection wells have been excluded based on nonproductivity and the calculations of gas generation flow rate for each excluded area;
5. The provisions for increasing gas mover equipment capacity with increased gas generation flow rate, if the present gas mover equipment is inadequate to move the maximum flow rate expected over the life of the landfill; and
6. The provisions for the control of off-site migration.

(9) Record Keeping Requirements. Except as provided in part (3)(B)2.A.(II) of this rule-

- (A) Each owner or operator of an MSW landfill subject to the provisions of subsection (3)(B) of this rule shall keep for at least five (5) years up-to-date, readily accessible, on-site records of the design capacity report which triggered subsection (3)(B) of this rule, the current amount of solid waste in-place, and the year-by-year waste acceptance rate. Records may be maintained off-site if they are retrievable within four (4) hours. A longer period is acceptable if records are needed for an unresolved enforcement action. Either paper copy or electronic formats are acceptable;
- (B) Each owner or operator of a controlled landfill shall keep up-to-date, readily accessible records for the life of the control equipment of the data listed in paragraphs (9)(B)1. through 4. of this rule as measured during the initial performance test or compliance determination. Records of subsequent tests or monitoring shall be maintained for a minimum of five (5) years. Records of the control device vendor specifications shall be maintained until removal.

- A. Where an owner or operator subject to the provisions of this rule seeks to demonstrate compliance with subparagraph (3)(B)2.B. of this rule-
 - A. The maximum expected gas generation flow rate as calculated in paragraph (6)(A)1. of this rule. The owner or operator may use another method to determine the maximum gas generation flow rate, if the method has been approved by the director; and
 - B. The density of wells, horizontal collectors, surface collectors, or other gas extraction devices determined using the procedures specified in paragraph (10)(A)1. of this rule.
- B. Where an owner or operator subject to the provisions of this rule seeks to demonstrate compliance with subparagraph (3)(B)2.C. of this rule through use of an enclosed combustion device other than a boiler or process heater with a design heat input capacity greater than forty-four (44) megawatts--
 - A. The average combustion temperature measured at least every fifteen (15) minutes and averaged over the same time period of the performance test; and
 - B. The percent reduction of NMOC determined as specified in part (3)(B)2.C.(II) of this rule achieved by the control device.
- C. Where an owner or operator subject to the provisions of this rule seeks to demonstrate compliance with subpart (3)(B)2.C.(II)(a) of this rule through use of a boiler or process heater of any size--a description of the location at which the collected gas vent stream is introduced into the boiler or process heater over the same time period of the performance testing.
- D. Where an owner or operator subject to the provisions of this rule seeks to demonstrate compliance with part (3)(B)2.C.(I) of this rule through use of an open flare, the flare type (that is, steam-assisted, air-assisted,

or nonassisted), all visible emission readings, heat content determination, flow rate or bypass flow rate measurements, and exit velocity determinations made during the performance test as specified in 40 CFR part 60.18 (incorporated by reference); continuous records of the flare pilot flame or flare flame monitoring and records of all periods of operations during which the pilot flame of the flare flame is absent;

(C) Each owner or operator of a controlled landfill subject to the provisions of this rule shall keep for five (5) years up-to-date, readily accessible continuous records of the equipment operating parameters specified to be monitored in section (7) of this rule as well as up-to-date, readily accessible records for periods of operation during which the parameter boundaries established during the most recent performance test are exceeded.

1. The following constitute exceedances that shall be recorded and reported under subsection (8)(F) of this rule:

- A. For enclosed combustors except for boilers and process heaters with design heat input capacity of forty-four (44) megawatts (150 million British thermal units per hour) or greater, all three (3)-hour periods of operation during which the average combustion temperature was more than twenty-eight degrees Celsius (28°C) below the average combustion temperature during the most recent performance test at which compliance with subparagraph (3)(B)2.C. of this rule was determined; and

- B. For boilers or process heaters, whenever there is a change in the location at which the vent stream is introduced into the flame zone as required under subparagraph (9)(B)3.A. of this rule.

2. Each owner or operator subject to the provisions of this rule shall keep up-to-date, readily accessible continuous records of the indication of flow to the control device or the indication of bypass flow or records of monthly inspections of car-seals or lock-and-key configurations used to seal bypass lines, specified under section (7) of this rule.

3. Each owner or operator subject to the provisions of this rule who uses a boiler or process heater with a design heat input capacity of forty-four

- (44) megawatts or greater to comply with subparagraph (3)(B)2.C. of this rule shall keep an up-to-date, readily accessible record of all periods of operation of the boiler or process heater. (Examples of such records could include records of steam use, fuel use, or monitoring data collected pursuant to other state or local regulatory requirements.)
4. Each owner or operator seeking to comply with the provisions of this rule by use of an open flare shall keep up-to-date, readily accessible continuous records of the flame or flare pilot flame monitoring specified under subsection (7)(C) of this rule, and up-to-date, readily accessible records of all periods of operation in which the flame or flare pilot flame is absent;
- (D) Each owner or operator subject to the provisions of this rule shall keep for the life of the collection system an up-to-date, readily accessible plot map showing each existing and planned collector in the system and providing a unique identification location label for each collector.
1. Each owner or operator subject to the provisions of this rule shall keep up-to-date, readily accessible records of the installation date and location of all newly installed collectors as specified under subsection (6)(B) of this rule.
2. Each owner or operator subject to the provisions of this rule shall keep readily accessible documentation of the nature, date of deposition, amount, and location of asbestos-containing or nondegradable waste excluded from collection as provided in subparagraph (10)(A)3.A. of this rule as well as any nonproductive areas excluded from collection as provided in subparagraph (10)(A)3.B. of this rule;
- (E) Each owner or operator subject to the provisions of this rule shall keep for at least five (5) years up-to-date, readily accessible records of all collection and control system exceedances of the operational standards in section (4) of this rule, the reading in the subsequent month whether or not the second reading is an exceedance, and the location of each exceedance; and
- (F) Landfill owners or operators who convert design capacity from volume to mass or mass to volume to demonstrate that landfill design capacity is less than two and one-half (2.5) million megagrams or two and one-half (2.5) million cubic meters, as provided in the definition of design capacity, shall keep readily

accessible, on-site records of the annual recalculation of site-specific density, design capacity, and the supporting documentation. Off-site records may be maintained if they are retrievable within four (4) hours of request. Either paper copy or electronic formats are acceptable.

(10) Specifications for Active Collection Systems.

(A) Each owner or operator seeking to comply with subparagraph (3)(B)2.A. of this rule shall site active collection wells, horizontal collectors, surface collectors, or other extraction devices at a sufficient density throughout all gas producing areas using the following procedures unless alternative procedures have been approved by the director as provided in parts (3)(B)2.A.(III) and (IV) of this rule:

1. The collection devices within the interior and along the perimeter areas shall be certified to achieve comprehensive control of surface gas emissions by a professional engineer. The following issues shall be addressed in the design: depths of refuse, refuse gas generation rates and flow characteristics, cover properties, gas system expandability, leachate and condensate management, accessibility, compatibility with filling operations, integration with closure end use, air intrusion control, corrosion resistance, fill settlement, and resistance to the refuse decomposition heat;
2. The sufficient density of gas collection devices determined in paragraph (10)(A)1. of this rule shall address landfill gas migration issues and augmentation of the collection system through the use of active or passive systems at the landfill perimeter or exterior; and
3. The placement of gas collection devices determined in paragraph (10)(A)1. of this rule shall control all gas producing areas, except as provided by subparagraphs (10)(A)3.A. and B. of this rule.
 - A. Any segregated area of asbestos or nondegradable material may be excluded from collection if documentation is provided as specified under subsection (9)(D). of this rule. The documentation shall provide the nature, date of deposition, location and amount of asbestos or nondegradable material deposited in the area, and shall be provided to the director upon request.
 - B. Any nonproductive area of the landfill may be

excluded from control, provided that the total of all excluded areas can be shown to contribute less than one percent (1%) of the total amount of NMOC emissions from the landfill. The amount, location, and age of the material shall be documented and provided to the director upon request. A separate NMOC emissions estimate shall be made for each section proposed for exclusion, and the sum of all such sections shall be compared to the NMOC emissions estimate for the entire landfill. Emissions from each section shall be computed using the following equation:

$$Q_i = 2 k L_o M_i (e^{-kt_i}) (C_{NMOC}) (3.6 \times 10^{-9})$$

where,

$$Q_i = \text{NMOC emission rate from the } i^{\text{th}} \text{ section, megagrams per year}$$

$$k = \text{methane generation rate constant, year}^{-1}$$

$$L_o = \text{methane generation potential, cubic meters per megagram solid waste}$$

$$M_i = \text{mass of the degradable solid waste in the } i^{\text{th}} \text{ section, megagram}$$

$$t_i = \text{age of the solid waste in the } i^{\text{th}} \text{ section, years}$$

$$C_{NMOC} = \text{concentration of nonmethane organic compounds, parts per million by volume}$$

$$3.6 \times 10^{-9} = \text{conversion factor}$$

The values for k , and C_{NMOC} determined in field testing shall be used, if field testing has been performed in determining the NMOC emission rate or the radii of influence (the distance from the well center to a point in the landfill where the pressure gradient applied by the blower or compressor approaches zero). If field testing has not been performed, the default values for k , L_o and C_{NMOC} provided in paragraph (5)(A)1. of this rule or the alternative values from (5)(A)5. of this rule shall be used. The mass of nondegradable solid waste contained within the given section may be subtracted from the total mass of the section when estimating emissions provided the nature, location, age, and amount of the nondegradable material is documented as provided in subparagraph (10)(A)3.A. of this rule.

- (B) Each owner or operator seeking to comply with part (3)(B)2.A.(I) of this rule shall construct the gas collection devices using the following equipment or procedures:

1. The landfill gas extraction components shall be constructed of polyvinyl chloride (PVC), high density polyethylene (HDPE) pipe, fiberglass, stainless steel, or other nonporous corrosion resistant material of suitable dimensions to--convey projected amounts of gases; withstand installation, static, and settlement forces; and withstand planned overburden or traffic loads. The collection system shall extend as necessary to comply with emission and migration standards established in this rule. Collection devices such as wells and horizontal collectors shall be perforated to allow gas entry without head loss sufficient to impair performance across the intended extent of control. Perforations shall be situated with regard to the need to prevent excessive air infiltration;
 2. Vertical wells shall be placed so as not to endanger underlying liners and shall address the occurrence of water within the landfill. Holes and trenches constructed for piped wells and horizontal collectors shall be of sufficient cross-section so as to allow for their proper construction and completion including, for example, centering of pipes and placement of gravel backfill. Collection devices shall be designed so as not to allow indirect short circuiting of air into the cover or refuse into the collection system or gas into the air. Any gravel used around pipe perforations should be of a dimension so as not to penetrate or block perforations; and
 3. Collection devices may be connected to the collection header pipes below or above the landfill surface. The connector assembly shall include a positive closing throttle valve, any necessary seals and couplings, access couplings and at least one (1) sampling port. The collection devices shall be constructed of PVC, HDPE, fiberglass, stainless steel, or other nonporous material of suitable thickness.
- (C) Each owner or operator seeking to comply with part (3)(B)2.A.(I) of this rule shall convey the landfill gas to a control system in compliance with subparagraph (3)(B)2.C. of this rule through the collection header pipe(s). The gas mover equipment shall be sized to handle the maximum gas generation flow rate expected over the intended use period of the gas moving equipment using the following procedures:
1. For existing collection systems, the flow data shall be used to project the maximum flow rate. If

no flow data exists, the procedures in paragraph (10)(C)2. of this rule shall be used; and

2. For new collection systems, the maximum flow rate shall be in accordance with paragraph (6)(A)1. of this rule.

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